

Chapter 10

Off-the-Shelf (COTS) Applications

Chapter Introduction

As more hardware comes “off-the-shelf”, there is an emerging expectation that applications should be available “off-the-shelf” as well.

COTS covers everything from “plug and play” components (such as Microsoft Office) to systems that contain a complex mix of commercial and non-commercial components.

Chapter Purpose

There is currently no clearly defined, industry-accepted standard for the COTS life cycle. The processes and issues presented in this chapter are intended to:

- Promote an awareness of potential risks
 - Provide a life cycle path and decision methodology for evaluating and selecting products for use in Customs environments
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Chapter Convention

For the purposes of this chapter, the term COTS will be used to cover both commercially-developed applications and applications developed by other government agencies (GOTS).

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Section A Background

Section Introduction The movement within the software industry to use commercial off-the-shelf (COTS) components for large systems is based on an expected set of advantages. However, there has not been sufficient time to:

- Quantify the impact of many of the expected advantages
 - Resolve many of the issues which have been identified to date
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Source Materials in this section are taken from presentations made to the Software Engineering Symposium, August 1997, and reflect the experiences of other organizations (both public and private) who have been heavily engaged in system development using off-the-shelf applications and components.

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Definitions

Application	A software package designed to perform a <u>full range of functionalities</u> without reference or interface to any components or modules outside the package.
Component	A software element designed to perform less than a full range of functions as a part of a larger system. A component will have interfaces into other portions of the system as required.
COTS	<p>Commercial Off-the-Shelf: A commercially-produced product created for licensing to multiple customers for which support is available through the product's manufacturer and/or various third party sources.</p> <p>A good COTS product has the following characteristics:</p> <ul style="list-style-type: none">• High Quality: Few (if any) product defects• A significant installed customer base• The product adheres to some specified standard• Published interfaces• Can be tailored by the user (i.e., altering or setting parameters, adding templates, scripting <u>without altering the source code</u>)

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Definitions, Continued

Customization	<p>If the source code is changed, either by the user or by the vendor at the user's behest, the product is considered as being a customized product.</p> <p>Depending on the nature of the changes made, this customization may not be upwardly or downwardly compatible with other releases of the vendor's products. Also, these alterations may need to be repeated with each release.</p> <p>If the vendor chooses to propagate the source code changes throughout the entire product line, then the customized product can be once again be considered as "off-the-shelf"</p> <p>Also see "Tailoring", below.</p>
GOTS	<p>Government Off-the-Shelf: Components developed by other government agencies that may be available either directly from the agency or from National Technical Information Service (NTIS).</p>
Mandatory Requirements	<p>The mission-critical User Requirements that a candidate component or product <u>absolutely must meet</u>. If a product cannot satisfy the mandatory requirements, it will not be considered for deployment in the Customs environments.</p>
Negotiable Requirements	<p>Important User Requirements that may be met by one or more solutions.</p> <p>Example: A requirement for a spreadsheet capability may be met by any one of a number of spreadsheet products currently on the market.</p>
"Nice To Have" Requirements	<p>These User Requirements cover those features that may serve to enhance the product's usability in support of Customs mission; however, they are not critical to meeting the User Requirements.</p> <p>Example: A component may offer a feature that will allow each user to tailor his/her screen colors. While this feature may provide a psychological benefit to the users, it is not essential for the success of the mission supported by the component.</p>

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Definitions, Continued

Source Code Escrow

The practice of having a third party (separate from both the vendor and the customer) hold a copy of the current production version of the source code for a software product or component as a strategy to mitigate the risk of vendor default.

Examples of vendor default:

- The vendor declares bankruptcy and goes out of business
- The vendor discontinues the product without giving adequate notice

If the vendor defaults, the third party releases the source code to the customer, who then has the option of using the source code in the same manner as a system developed in-house.

Standard

A widely accepted, established norm that is independent of any specific vendor or product.

Example: ASCII

Usually standards are established by:

- Recognized national or international industrial bodies like IEEE or ANSI
- Governmental bodies like the National Institute of Standards and Technology (NIST)

Tailoring

Some products have specified components where users may enter their own parameters, rules, templates, or data **without altering the source code**. These user additions are defined as tailoring.

This tailoring is usually upwardly or downwardly compatible with other releases of the same product and may not need to be repeated with each new release.

Also see “Customization” above.

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Definitions, Continued

**Wrapping or
“Glueing”**

The development of system code, independent of the application source code, which:

- Encapsulates a legacy component (as for a security requirement)
 - Provides interfaces among all system components (both COTS and in-house developed)
-

COTS Advantages

Introduction	Most of the advantages to using COTS revolve around doing more, doing it faster, and doing it cheaper.
Integration vs. Custom Coding	By using COTS, an organization can take advantage of using one underlying architecture as a system base. If this base remains stable, additional components can be integrated in a relatively short amount of time.
Proven Track Record	If other agencies and private sector organizations are using a component, it is possible to verify their experiences with the software, the vendor, and perhaps the integrator.
Reduced Development Costs	<p>The vendor has already borne the development costs and will recoup these costs through product licensing fees. The agency does not have to make a major investment in development and quality testing.</p> <p>In the case of applications/components developed under contract for other government agencies (GOTS), the originating agency may re-coup part of the development costs under an interagency agreement or memorandum of understanding.</p>
Reduced Staffing	<p>Staffing level reductions may be possible because the agency will not be involved in development.</p> <p>COTS allows scarce development resources to be used for unique, mission-specific applications and components.</p>
Access to New Technologies	By using off-the-shelf software, the organization gains access to the newest programming technologies through upgrades and new version releases by the vendor.

COTS Issues

Introduction	The solution to many (if not most) of these issues involved in using off-the-shelf software depends on the resolve and ability to perform exhaustive product surveys and/or evaluations before making a selection or upgrade.
<hr/>	
Types of Issues	<p>The issues involved in using off-the-shelf software fall into eight general categories which are discussed below:</p> <ul style="list-style-type: none">• Awareness• Relationship Management• Impact of Change• Technical and Integration• Resource Management• Legal and Contractual• Process Dynamics• Lack of Progress <p>Some of these issues relate to the internal processes, practices and disciplines necessary to effectively manage COTS/GOTS resources within an organizational setting.</p>
<hr/>	
Awareness	<p>There are four items that the Product Selection Team must pay special attention to:</p> <ul style="list-style-type: none">• Products: The organization must be aware of what is available in the marketplace. This requires a staffing level that would permit someone to continuously monitor industry publications and attend selected conferences during the year.• Management Motivation: Management may wish to make decisions either for or against a specific application or component based on political considerations. In these cases, the decision may ignore:<ul style="list-style-type: none">▸ The component's ability to fulfill mandatory user requirements▸ The component's technical compatibility with existing systems

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COTS Issues, Continued

Awareness (continued)

- **Security:** All components may not have the same level of security. In a system with multiple components, security gaps may be inadvertently introduced between components, allowing unauthorized access.
- **Data Entity Names:** Each component may have its own vocabulary for the same domain.

Example: Component A may call the person identifier “Lastname” with a format of “x-number of characters”, while Component B may call the person identifier “Name” with a format of “x+y-number of characters”.

Relationship Management

In order to use COTS effectively, the organization must maintain a balance among the following types of relationships:

- **Numbers of Vendors:** Some vendors will create numerous components; other will create only a few. How will the organization balance these relationships? Is it better to deal with a few vendors who produce multi-functional suites of components, or deal with more vendors who each produce fewer components of higher quality?
 - **Vendor Responsiveness:** In general, smaller companies are more responsive to customer needs. However, they may lack the stability and track record found with larger software producers.
 - **Schedule and Delivery:** Schedule and delivery issues may make it difficult to build a COTS-based system. This implies the necessity of maintaining a relationship with the vendor that will allow for penalties if scheduled delivery dates slip beyond a certain point.
 - **End Users:** Relationships with end users must be managed regardless of how the functional capability is provided. It is essential to communicate a clear understanding of the compromises which may be necessary in building a COTS-based system.
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COTS Issues, Continued

Change Management

Each time a component is changed, there may be unexpected and unpredictable results. To minimize the impacts on the business, a thorough analysis of the changes and a migration plan should be developed. Concerns include:

- The use of source code escrow as a risk mitigation strategy against vendor default raises a large set of legal and development strategy issues.
- Component updates may change the look and feel of the system to the users. Each upgrade/revision should be assessed to determine what (if any) additional user training may be necessary.
- Changes to key components in the system can impact every component in the system.

Technical and Integration

Technical and integration issues include (but are not necessarily limited to) the following:

- There may be no component in the marketplace which will perform the required functionality in an efficient and reliable manner.
- Components in a distributed environment may be tailored or customized locally, leading to version control problems during upgrades.
- In RFPs, how do we specify components to ensure that the agency obtains the functionality it needs without violating procurement regulations?
- Each component may have its own transaction and multi-user models. These models must be reconciled.
- In fitting components into a system architecture, a decision must be made about which component(s) will serve as gateways to other products.

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COTS Issues, Continued

Resource Management

- **Tracking:** There are a number of tracking issues associated with COTS systems. These include, but are not limited to:
 - Versions
 - Problems
 - Component Dependencies
- **Personnel:**
 - There is a shortage of trained managers for COTS-based systems.
 - Component selection and evaluation is human-intensive. Savings realized by reduced development staffing may be offset by the increased staffing needed for requirements definition, component evaluation, and component selection.
- **Capacity Planning:** No accurate way to measure the platform or infrastructure resource consumption of specific sets of off-the-shelf components.

Legal and Contractual

Some legal and contractual considerations include:

- Long-term business agreements with vendors may become unfavorable and limit options and plans.
 - If proprietary information is needed from vendors, how will it be obtained and safeguarded? Also provisions must be made for non-disclosure agreements.
 - Is the vendor willing to escrow the source code for the most recent release? If so, who will hold the code? How and when will it be released?
 - What if the product fails acceptance testing? Can the agreement be canceled? If so, how?
 - Contrary to policy statements, current government acquisition regulations do not encourage COTS-based systems.
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COTS Issues, Continued

Process Dynamics

The development and maintenance dynamics for COTS-based systems are not yet understood or documented. Some issues to consider include:

- There are no universal standards for COTS systems.
- The wait time for fixes and enhancements may become unacceptable.
- How can testing, integration, and customization rework be avoided for new versions of components?

Lack of Progress

Customs is also impacted by our own experiences with COTS software. Concerns include:

- Current market leaders sell applications suites, not components. Therefore, Customs may have to take the “whole package” rather than just those portions that fit our processes.
 - We do not fully understand how to specify, test, or document components for COTS-based systems.
 - Mobile and distributed components will be hard to debug.
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Section B

COTS Decision Process

Introduction The decision to employ a COTS-based solution can have both positive and negative impacts for the project and for the Customs Service as a whole.

This section provides an overview of the process which should be used to make the decision on whether or not to use a COTS product to meet a business need.

Definitions

Domain: A problem or subject area to be addressed by a computational component or application.

Portfolio: The listing of products that have been evaluated and approved for use within the Customs environment. Each product may support one or more domains.

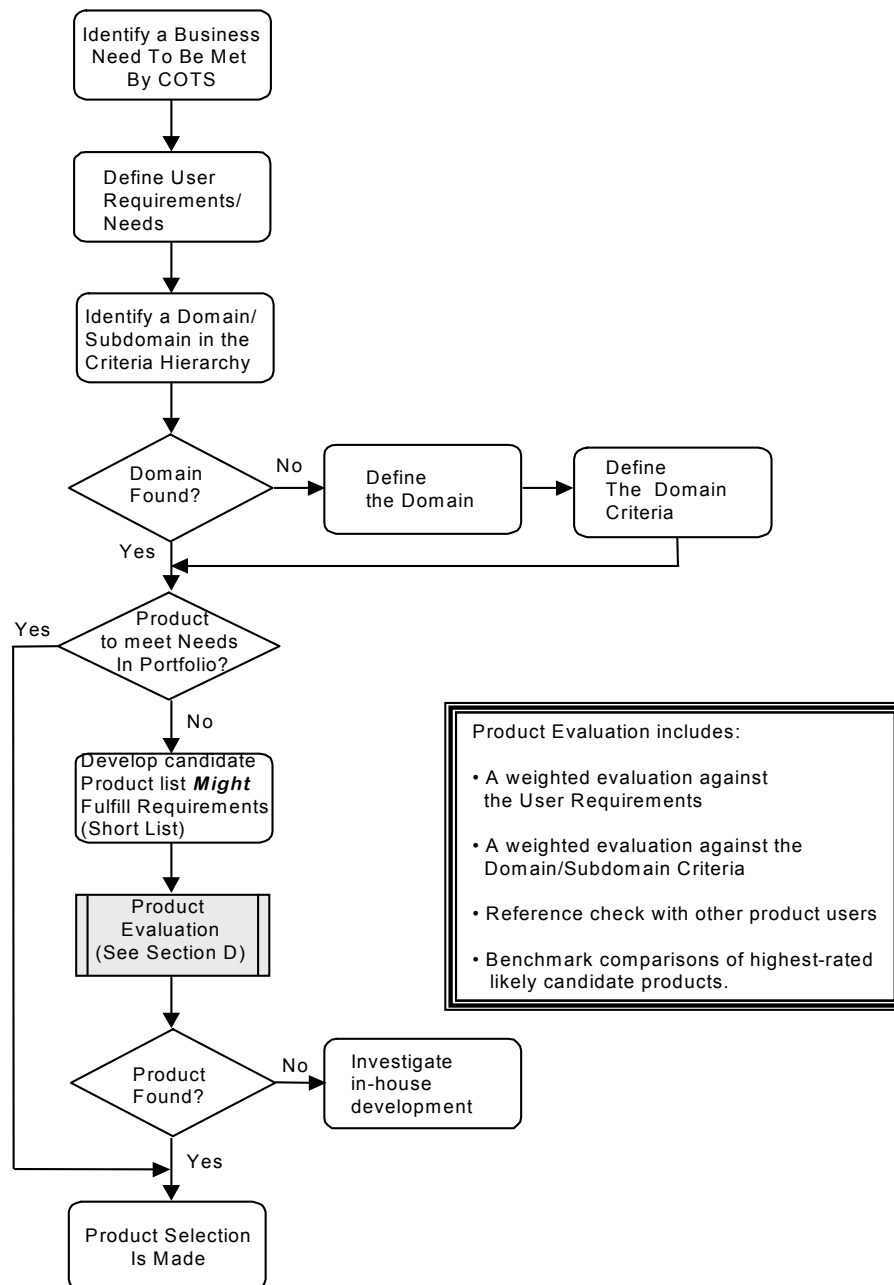
Short List: A list of the four or five products most likely to meet the domain and requirements criteria.

Reference *United States Customs Service Technology Portfolio [v1.0]*, July 21, 1997

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COTS Decision Process Diagram

Process Diagram



COTS Decision Process Key Activities

Key Activities

Stage	Description										
1	The Business Sponsor(s) identifies a business need that might be met by a COTS product.										
2	<p>The Business Sponsor(s) and/or the Project Initiation Team should define the user requirements to be met by the COTS/GOTS product.</p> <p>In addition to the user requirements and testing/acceptance criteria based on these requirements, the following functional (technical) areas should also be addressed.</p> <table> <tr> <th>Type of Requirement To Be Defined ...</th><th>In Consultation With ...</th></tr> <tr> <td>Conformance to Technical Architecture</td><td>Technical Architecture Group</td></tr> <tr> <td>Security Internal to the Product Between Components</td><td>AIS Security</td></tr> <tr> <td>Operations Database Mainframe Interface Etc.</td><td>System Operations</td></tr> <tr> <td>Network</td><td>Network</td></tr> </table>	Type of Requirement To Be Defined ...	In Consultation With ...	Conformance to Technical Architecture	Technical Architecture Group	Security Internal to the Product Between Components	AIS Security	Operations Database Mainframe Interface Etc.	System Operations	Network	Network
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Operations Database Mainframe Interface Etc.	System Operations										
Network	Network										

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COTS Decision Process Key Activities, Continued

Key Activities (continued)

Stage	Description						
3	The Business Sponsor should consult the <i>United States Customs Service Technology Portfolio [v1.0], July 21, 1997</i> to determine whether a domain for the business need has been established.						
	<table><tr><th>IF...</th><th>THEN...</th></tr><tr><td>A Domain has been defined</td><td>The Business Sponsor(s) and/or Project Initiation Team examine the highest rated product for that domain to ensure that it meets the stated User Requirements.</td></tr><tr><td>A Domain has NOT been defined</td><td>The Business Sponsor(s) and/or Project Initiation Team should work with TAG to define the Domain, its criteria, and a short list of products.</td></tr></table>	IF...	THEN...	A Domain has been defined	The Business Sponsor(s) and/or Project Initiation Team examine the highest rated product for that domain to ensure that it meets the stated User Requirements.	A Domain has NOT been defined	The Business Sponsor(s) and/or Project Initiation Team should work with TAG to define the Domain, its criteria, and a short list of products.
	IF...	THEN...					
	A Domain has been defined	The Business Sponsor(s) and/or Project Initiation Team examine the highest rated product for that domain to ensure that it meets the stated User Requirements.					
A Domain has NOT been defined	The Business Sponsor(s) and/or Project Initiation Team should work with TAG to define the Domain, its criteria, and a short list of products.						
4	The Business Sponsor should examine the Customs Technology Portfolio to determine if there is a product that will meet the requirements.						
	<table><tr><th>IF...</th><th>THEN...</th></tr><tr><td>One or more products are found that meet User Requirements</td><td>A product is selected to serve as the basis for the IT Funding Request Worksheet (ITFRW)</td></tr><tr><td>No products are found that meet User Requirements</td><td>The Business Sponsor(s)/ Project Initiation Team builds a short list of candidate products in the market place.</td></tr></table>	IF...	THEN...	One or more products are found that meet User Requirements	A product is selected to serve as the basis for the IT Funding Request Worksheet (ITFRW)	No products are found that meet User Requirements	The Business Sponsor(s)/ Project Initiation Team builds a short list of candidate products in the market place.
	IF...	THEN...					
	One or more products are found that meet User Requirements	A product is selected to serve as the basis for the IT Funding Request Worksheet (ITFRW)					
No products are found that meet User Requirements	The Business Sponsor(s)/ Project Initiation Team builds a short list of candidate products in the market place.						

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COTS Decision Process Key Activities, Continued

Key Activities (continued)

Stage	Description						
5	<p>Candidate products are evaluated against:</p> <ul style="list-style-type: none"> • User Requirements • Domain Requirements <p>References:</p> <ul style="list-style-type: none"> • Section C, <i>COTS Evaluation Process</i> • <i>United States Customs Service Technology Portfolio [v1.0]</i>, July 21, 1997 						
6	<p>The results of the evaluation are analyzed:</p> <table> <tr> <th>IF...</th><th>THEN...</th></tr> <tr> <td>One or more products pass the evaluation</td><td>A product is selected to serve as the basis for the ITFRW and CBA</td></tr> <tr> <td>No products pass the evaluation</td><td>The Business Sponsor(s) and/or Project Initiation Team should investigate in-house development options.</td></tr> </table>	IF...	THEN...	One or more products pass the evaluation	A product is selected to serve as the basis for the ITFRW and CBA	No products pass the evaluation	The Business Sponsor(s) and/or Project Initiation Team should investigate in-house development options.
IF...	THEN...						
One or more products pass the evaluation	A product is selected to serve as the basis for the ITFRW and CBA						
No products pass the evaluation	The Business Sponsor(s) and/or Project Initiation Team should investigate in-house development options.						

Section C

COTS Evaluation Process

Section Purpose This section will present the general outline of evaluation procedures which have been proven effective in other organizations.

The Keys to Success The keys to the successful use of COTS are:

- A thorough evaluation of each candidate component or product and the vendor by a competent team composed of users and technical personnel, and for enterprise level systems, a system integrator.
- A clear, comprehensive, well-defined set of User Requirements.

Evaluation Purpose A properly-done component evaluation process serves three major purposes:

- To identify products that will meet Customs requirements in a cost-effective manner or points to the need for in-house development
- To fill gaps in the Customs Technology Portfolio
- To provides information that forms the heart of the Cost/Benefit Analysis.

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Evaluation Process Overview

The Process

The following activities should be performed in the selection of off-the-shelf software.

Stage	Description
1	Initial Stage Activities: <ul style="list-style-type: none">• Define, document, and certify User Requirements• Identify or define (if necessary) a domain and its evaluation criteria• Determine the weight to be assigned to each:<ul style="list-style-type: none">▸ User Requirement▸ Domain Criteria
2	Identify candidate products
3	Evaluate candidate products against the user requirements
4	Evaluate candidate products against the domain criteria
5	Calculate composite scores for each candidate component
6	Make a selection and document rationale/recommendations
7	Use information from this evaluation to prepare the Cost/Benefit Analysis for project approval

Roles and Responsibilities

Introduction

There are three groups within Customs who must be involved in the evaluation and selection of COTS components. These are:

- Business Sponsor
- The Product Evaluation Team
- The Office of Information and Technology (OIT)

The roles and responsibilities of each is discussed below.

Business Sponsor

Role: The Business Sponsor is the individual or organization who has identified a business need and will be providing the financial resources to implement the selected components.

Responsibilities: The Business Sponsor has six responsibilities in product selection:

- To organize a Product Evaluation Team if necessary -- These people may or may not be the same individuals involved in the Project Initiation Team.
 - To specify and certify the requirements that the product must satisfy
 - To identify at least one component available in the market place which may meet the critical requirements of the system
 - To attend the evaluation summary meeting
 - To ask questions until all there is a clear, shared understanding of the evaluations, including all the risks and trade-offs associated with each candidate component
 - To negotiate/coordinate with appropriate OIT personnel in making the final decision from among the highest-scored candidate components/products
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Roles and Responsibilities, Continued

**Product
Evaluation
Team**

Role: The team has two basic functions:

- Evaluate all candidate components objectively and document those evaluations
- Schedule an evaluation summary meeting with the Business Sponsor to present the results of the evaluation

Responsibility: The team is responsible for preparing and presenting information covering the candidate components with the highest composite scores. The presentation should include:

- An open and honest description of the advantages and disadvantages offered by each candidate product in relation to the user requirements:
 - ▶ Which mandatory requirements does it meet and how?
 - ▶ Which “necessary but negotiable” requirements does this product meet? What are the areas that may be negotiated? What are the possible trade-offs?
 - ▶ What “Nice to Have” features does this component contain?
 - A realistic summary of the integration issues (if any) for each candidate component
 - A summary of costing and licensing advantages and disadvantages for each candidate component
 - A summary of any technical issues that may represent risks to project success
 - A clear statement as to the team consensus on the best choice -- This should be reflected in and supported by the evaluation scores.
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Roles and Responsibilities, Continued

OIT

Role: The Office of Information and Technology will provide technical support to the Business Sponsor and the Product Evaluation Team.

Responsibilities: OIT will support the Business Sponsor in the decision-making process by:

- Adding to the list of components to be evaluated from industry sources or the Enterprise Portfolio, if possible
 - Providing the Business Sponsor with an evaluation of any technical trade-offs that may be necessary to use COTS
 - Negotiating/ coordinating with the Business Sponsor in making the final decision from among the highest-scored candidate components/products
 - Providing technical personnel to serve on and support the Product Evaluation Team
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Differences of Opinion

When the Business Sponsor and/or the Product Evaluation Team and/or OIT have differences they cannot resolve through negotiation, the question shall be elevated to an appropriate level within Customs.

Initial Activities

Introduction	<p>These activities should be completed before the project team begins its evaluation of COTS application software.</p>
Evaluation Areas	<p>There are two major types of evaluations that should be done:</p> <ul style="list-style-type: none"> • Evaluation of components against Customs requirements • Evaluation of components against the appropriate domain criteria from the Customs Technology Portfolio <p>Each of these evaluations should be assigned a relative weight based on its importance.</p> <p>Example: Evaluation team XYZ chose to assign the following relative weights:</p> <ul style="list-style-type: none"> • 60% on user requirements • 40% on domain criteria
User Requirements Weighting	<p>User requirements should be thoroughly defined, documented, certified, and understood by all members of the project team before component evaluation begins.</p> <p>Each requirement is given a relative weight, depending on its importance to the success of Customs mission.</p> <p>Example: A project has 10 requirements. The team has chosen a scale of 1 to 5 with 5 being the highest possible value. The most critical requirements would be given a score of “5” while the least important requirement would be given a score of “1”.</p> <p>User requirements can be defined using either:</p> <ul style="list-style-type: none"> • The model presented in Volume I, Chapter 6, <i>Project Initiation</i>. • The model presented in the ISP, BSD, and BAA Phases of Information Engineering in Volume II, Chapter 9, <i>Information Engineering Life Cycle</i>

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Initial Activities, Continued

**Domain
Scoring and
Weighting**

The Customs Technology Portfolio assigns weights to each of the criteria areas. The total of these weights should equal 100.

The rankings used in evaluating each product against the criteria are as follows:

- 1 = Poor
- 2 = Fair
- 3 = Average
- 4 = Good
- 5 = Excellent

**Combining
Scores**

The Product Evaluation Team must specify the method to be used to combine the scores given by individuals to each product in each of the evaluation areas into one number which reflects the overall rating of the product. This can be done either by:

- Adding all the individual scores for each evaluation area
 - Averaging the scores for each evaluation area
-

Requirements Evaluation

Criticality	This is the most critical evaluation to be performed against candidate software applications/components. Every automated system exists because it meets some processing requirement as defined by the user.
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Role of User Requirements	Before starting to evaluate an off-the-shelf software package, every member of the team should have a clear understanding of the user requirements to be satisfied by the software acquisition, including which requirements are:
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- **Mandatory:** mission critical requirements that cannot be negotiated or modified
- **Negotiable:** Requirements that may be settled by one or more solutions

Example: A requirement for spreadsheet capabilities may be met by using either Excel or Quatro.

- **“Nice to Have”:** Requirements that would support mission execution but are not absolutely necessary for mission accomplishment

These requirements should be reviewed and certified as if the Business Sponsor were agreeing to a regular, in-house development project.

Reference:

- Volume II, Chapter 7, *Traditional Waterfall Life Cycle*
- Volume II, Chapter 14, *Requirements Documents*

If a product does not meet and support Customs mandatory requirements, no further resources should be spent on that product in the evaluation process.

However, if the Business Sponsor wishes to continue the evaluation of a product that meets some but not all of the mandatory requirements, the costs associated with customization (initial customization charges/fees and the charges/fees that will be repeated with each new release) must be included in the cost evaluations.

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Requirements Evaluation, Continued

**“Best”
Practices**

Three practices enhance the chances that a candidate package will fulfill its vendor promises:

- Each candidate software package should be evaluated by more than one person. If possible, every candidate package should be evaluated by every member of the team.
- Though evaluations should be independent, each evaluator should have a standardized list of the evaluation criteria.
- A single, final product requirements score should be reached by team consensus.

**Requirements
Evaluation
Procedure**

The following procedure should be followed when evaluating the product against user requirements:

Step	Description
1	If possible, obtain a copy of the candidate component and all pertinent operating documentation from the vendor. Warning: All applicable copyright and licensing restrictions must be observed.
2	Verify that the software is virus-free and load it onto the target platform.
3	Score the candidate software’s performance against each item in the user requirements list.

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Requirements Evaluation, Continued

**Requirements
Evaluation
Procedure**
(continued)

Step	Description
4	<p>To obtain a final requirements score:</p> <ul style="list-style-type: none">• Multiply the requirements score given each item by its relative weight to obtain a weighted item score.• Add the resulting weighted item scores to obtain a final requirements score.• Combine the final requirements scores given by each evaluator to determine the total requirements score.

Domain Criteria Evaluation

Introduction

Each application domain in the Customs Technology Portfolio has a series of appropriate functional/technical criteria associated with it.

These criteria include (but are not necessarily limited to):

- Standards
 - Security
 - Web Support
 - Performance
 - Costs
 - Vendor-Related Issues
-

**“Best”
Practices**

During the evaluation, assistance should be sought from all appropriate technical support personnel.

Products should also be compared on how well they meet the acceptance test criteria which were developed based on the user and domain requirements. In some cases, this may involve testing an evaluation copy of each product and benchmarking the results in a controlled environment.

**Domain
Scoring**

A final technical score for each product would be obtained by:

- Multiplying the criteria score given each area by its relative weight to obtain a weighted score
 - Summing the resulting weighted scores to obtain a final domain score.
 - Combining the final domain scores given by each evaluator to determine the total domain score
-

Reference

Volume II, Chapter 17, Section C, *COTS Product Evaluation Criteria*

Composite Scores

Overview Once all the products have been evaluated on all criteria, a composite score should be determined for each product.

Composite Scoring A composite score will be determined for each product. It shall be determined by:

- Multiplying the total score given each evaluation area (requirements and domain) by its relative weight (as determined in the initial activities) to obtain a weighted product score for each evaluation area
 - Summing the resulting weighted product scores to obtain a final product score
-

Example

- Team XYZ evaluates 7 products. They have specified that the method of combining individual scores will be simple addition.
- Product 7 has a requirements score of 200 and a domain score of 300.
- The team chose to weight the areas as 60% on user requirements and 40% on domain criteria.

Evaluation Area	Relative Weight	Component Score	Total
Requirements	60%	200	120
Domain	40%	300	120
Composite Score for Product Number 7			240

Section D

COTS Life Cycle

Section Overview

This section will:

- Present a diagram of the COTS life cycle to be used at Customs in the absence of a recognized industry standard
 - Discuss the differences between a traditional life cycle and COTS
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COTS And The IRB

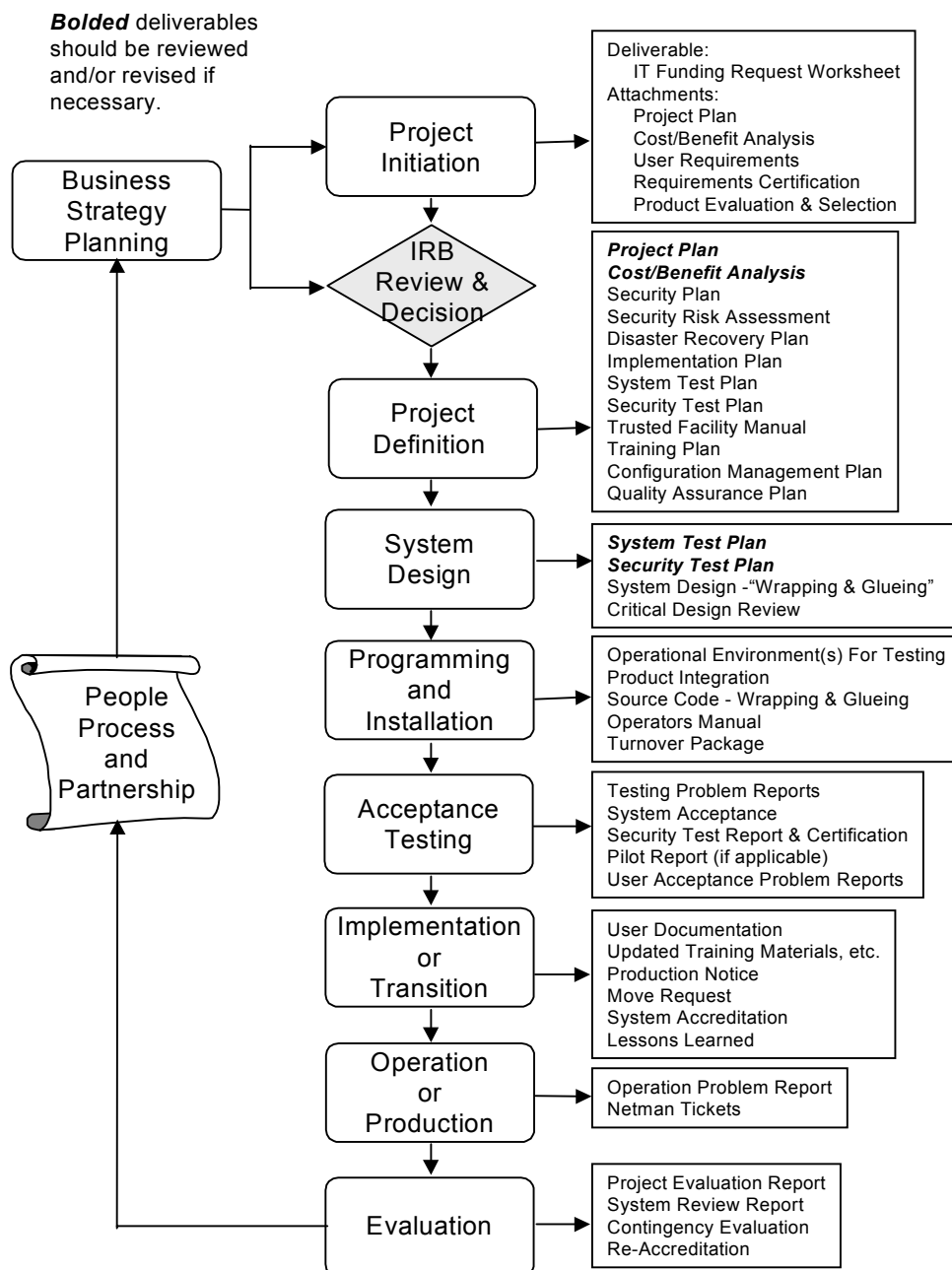
Product/component evaluations should be done as part of Project Initiation so the results can be documented in the Cost/Benefit Analysis section of the IT Funding Request Worksheet for the Investment Review Board (IRB) or project approval authority.

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COTS Life Cycle Diagram

Life Cycle Diagram



Differences from Traditional Life Cycles

Introduction	Because the project is purchasing a system component rather than building it to previously specified and accepted internal standards, the COTS life cycle has the following major differences from the standard waterfall and incremental models:
When the Work Is Done	<p>In using a COTS life cycle, most of the effort is done before the approval decision. In addition to the regular SDLC deliverables due in the Project Initiation Phase, the following items must be generated:</p> <ul style="list-style-type: none">• A certification of the User Requirements• A documented product evaluation or selection process in the case of a product not currently in the Enterprise Architecture portfolio• The rationale for the final product selection
User Requirements	User requirements must be carefully defined and reviewed to ensure that everyone involved in the evaluation process understands each requirement and the relative weights assigned to the various requirements.
Evaluation vs. Design	<p>Much of the pre-installation schedule is spent evaluating the candidate components/products</p> <ul style="list-style-type: none">• If the products are in Customs portfolio, one may be selected with a short justification• If there is no product to meet the User Requirements in Customs Portfolio, the Project Initiation Team must thoroughly evaluate candidate products and document those evaluations in a manner that will satisfy any applicable legal and/or contracting standards.

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Differences from Traditional Life Cycles, Continued

Integration vs. Programming

Integration is the task of installing a component into the system and creating source code which will allow the component to interface with all other applicable components currently existing in the system. Integration:

- Allows components to share data
- Allows components to work as sub-routines of other components

NOTE: The source code for this “glue” is considered a deliverable the same as source code in a traditional development effort. It must adhere to all applicable standards and have proper internal documentation.

Project Definition

**Updates/
Revisions**

The following documents should be reviewed and/or revised as necessary during the Project Definition phase of the COTS life cycle:

- The Project Plan
- The Cost/Benefit Analysis

User Requirements should already be defined and certified if a valid product evaluation and selection was performed.

**Beginning
Activities**

Activities are begun to generate the following documents:

- The Product Implementation/Deployment Plan, which includes:
 - Any periods of parallel operations
 - Plans for field pilots, if applicable
 - Network/communications requirements, if applicable
 - Data Management Plan (may be part of the Product Implementation Plan)
 - Training Plan(s) (may be part of the Product Implementation Plan)
 - For technical personnel who will be supporting the product
 - For customers who will be using the product
 - System Test Plan which includes
 - The acceptance test criteria developed during evaluation
 - Additional system/product-specific tests
 - Security Deliverables
 - Security Test Plan (may be part of the System Test Plan)
 - Security Plan
 - Security Risk Assessment
 - Trusted Facility Manual
 - Disaster Recovery and/or Contingency Plan
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System Design and Programming/Integration

System Design During this phase of the life cycle:

- The integrator designs and documents any source code needed to allow the product to:
 - Operate within the target environment
 - Interface with other system components
- Customization, tailoring activities, and options should be analyzed and documented.
- The testing plans (both system and security) should be reviewed and revised if necessary

Programming/Integration During this phase of the life cycle, the following activities are performed:

- Any necessary source code for “glueing and wrapping” the components is generated
- The product is installed in an appropriate test environment, with all required interface code in place
- The System Development Team performs initial unit and integration testing to ensure that the product was installed properly and meets requirements
- The System Development Team prepares program documentation as appropriate. This includes documenting:
 - Assumptions
 - Parameters
 - New Code
 - Scripts
 - Any installation modifications
- The System Development Team prepares a Turnover package.

Reference: Volume II, Chapter 7, Section D, *Programming or Construction*

Acceptance Testing

Testing

COTS products must undergo three types of testing before being introduced into Customs production environments:

- **Systems Testing:** The product must be tested to determine its impact on other components in the target environment. This is done by SAT, Systems Operations, and/or Quality Assurance Testing (QAT) as appropriate.
- **Security Testing:** The product must be tested to identify any potential security gaps between components and internal security deficiencies that could result in loss to Customs. This may be done by AIS Security or other testing organizations, as appropriate.
- **User Acceptance Testing:** The Business Sponsor and/or appropriate representatives test the product to ensure that all functions needed to meet the user requirements are present in the version going into production.

NOTE: These testing procedures must be repeated with each new release/version of products already in Customs production environments.

What If A Product Fails?

If a product fails any one of the above types of testing, the Business Sponsor(s) has two alternatives:

- Ask the vendor to correct the deficiencies in order to bring the product into compliance with Customs technical requirements. The CBA should be updated to reflect any additional costs.
- Cancel the contract/agreement and evaluate other products from the short list or the Customs portfolio.

The original contract should be written to allow for this possibility.

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Acceptance Testing, Continued

Preparation for Implementation	<p>The Product Deployment Plan and schedules are updated. This includes ensuring that:</p> <ul style="list-style-type: none">• Organizational policies are updated to reflect the functionality provided by the product/component, as appropriate• Procedures are updated to reflect any changes in the way Customs does business• All system documentation is updated to reflect the addition of the new product/component• Training materials are prepared• The Security Certification Package is also prepared for review and approval.
Pilot Testing	<p>Planning for pilot testing is done as part of the Deployment Plan in consultation with the Business Sponsor, the Technical Architecture Group, and the User Support organizations within OIT.</p> <p>Each pilot site should provide regular reports to the Project Team regarding their use of the product/component and the results.</p> <p>Any problems encountered should generate problem reports that must be addressed before the product goes into agency-wide production.</p>

Implementation or Transition

Introduction There are four activities that are performed during this portion of the life cycle:

- Training users and technical support personnel
 - Installing the product
 - Parallel Operations
 - Lessons Learned Review
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Training Users and Technical Support Personnel Training is defined and provided for two audiences:

- Users must be trained in using the new product/component.
- Technical support personnel (including Help Desk staff) should receive appropriate training to perform their tasks.

Note: When the new software is a new version of something already in a production environment, training requirements may be minimal.

Installing the Product Deployment of a COTS package includes the following activities:

- System Accreditation is applied for as required. No system can be implemented without a System Accreditation statement.
 - The product is installed on the appropriate production platform. This should be coordinated with Systems Operations and/or LAN Support personnel.
 - Any necessary data conversions are performed.
 - An Implementation Notice is prepared.
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Implementation or Transition, Continued

**Parallel
Operations**

Working with the Business Sponsor(s), OIT personnel shall determine what period of parallel operations with the old system and the new system may be appropriate.

A firm cut-over date should be established to mark the end of the parallel operations.

**Lessons
Learned
Review**

The System Development Team will conduct and document an internal project review to:

- Record project experiences and lessons learned
 - Provide guidance for future projects
 - Review the quality of the newly installed product
 - Recommend process improvements
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Operation and Evaluation

Operation	Once a product/component is in Customs Production environment, it is monitored and reported on in the same manner as any other software product used by Customs.
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Reference: Volume II, Chapter 7, Section G, *Operation or Production*

Evaluation	Periodic evaluations of COTS products will be conducted in accordance with the procedures instituted by the Program Management Staff, OIT.
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Reference: Volume II, Chapter 7, Section H, *Evaluation*

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